

Supernova remnants and fermi bubbles: LOFAR images of M 82 and NGC 3079

LOFAR status meeting

2015-04-29

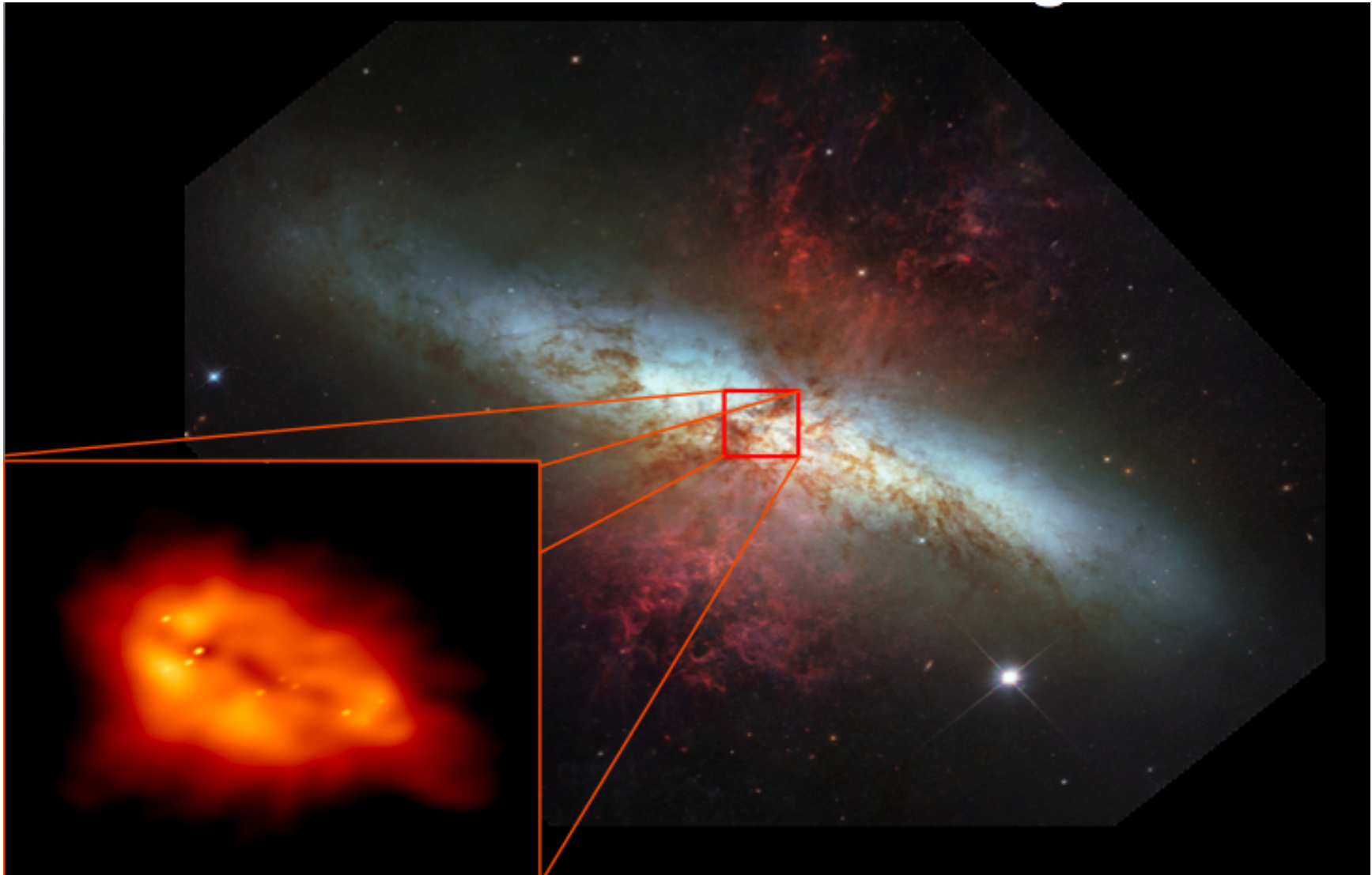
Eskil Varenius

The starburst galaxy M 82

Aim: Study star formation in M82 nucleus (3.6 Mpc) with international LOFAR.

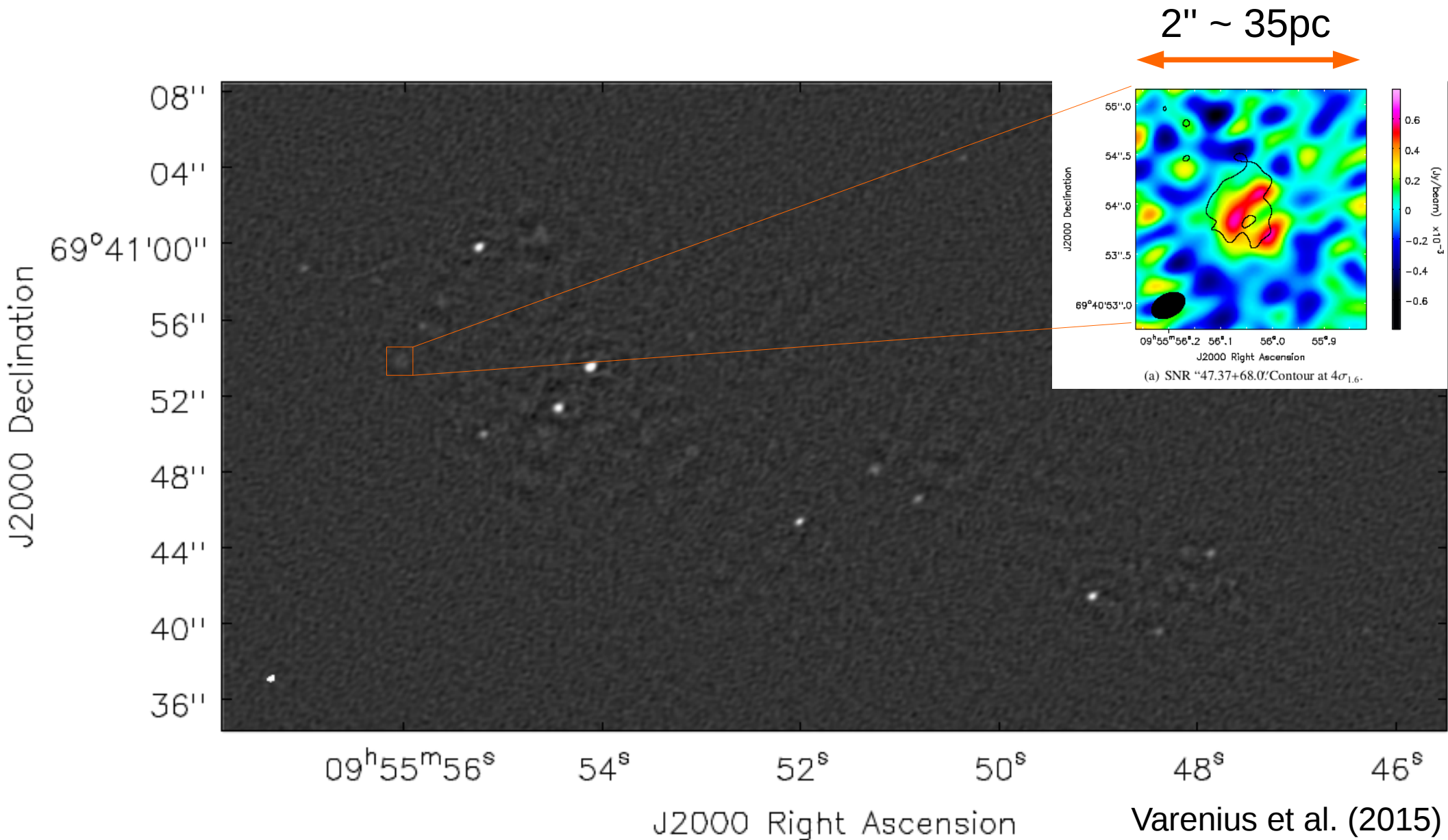
Data: Project LC0_026, 16h, 32MHz bandwidth split around 118 and 154 MHz.

Results: Images with res. 0.3" and sens. 0.15 mJy/beam (Varenius et al. 2015).

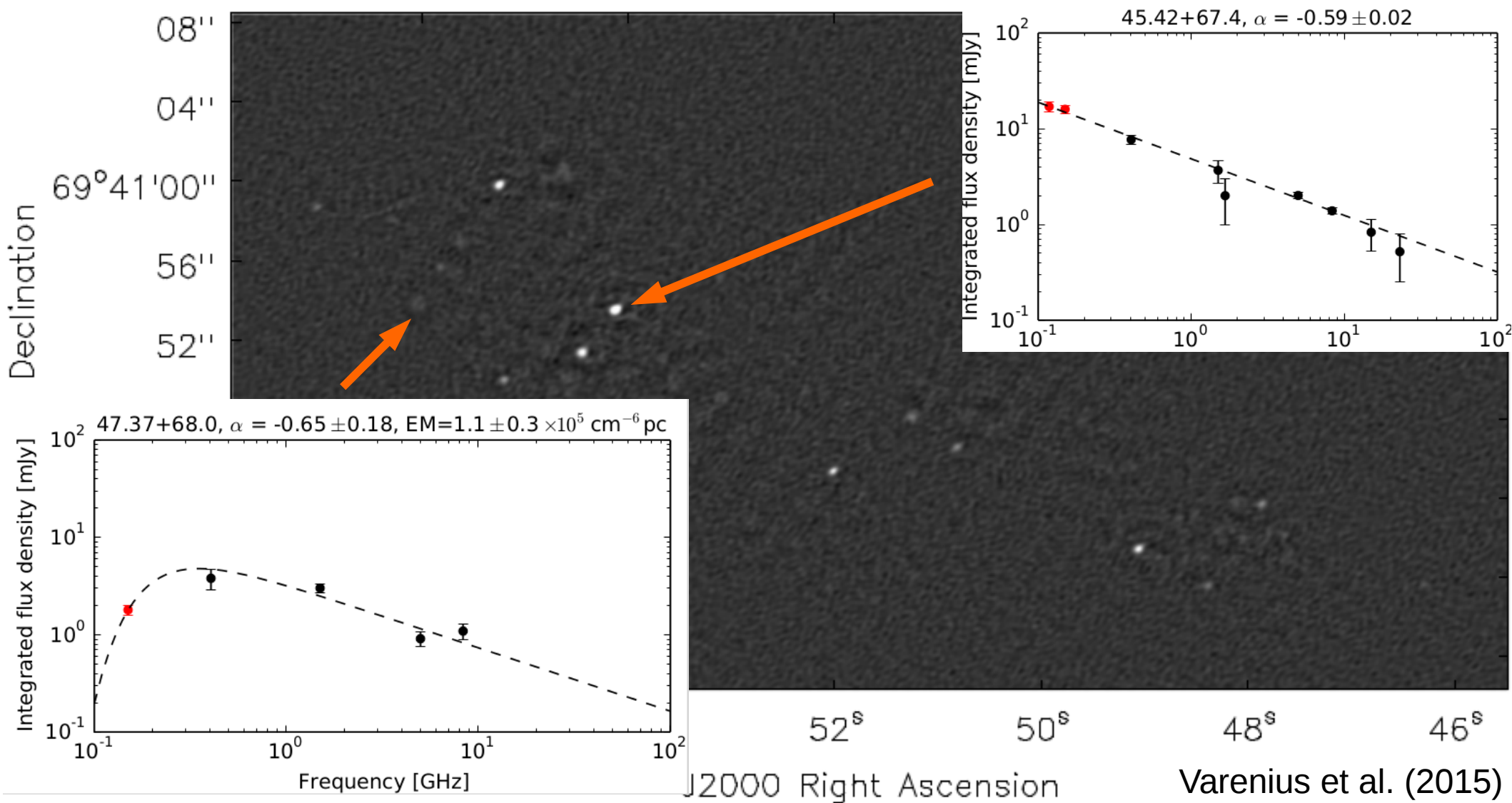


Optical image credit: NASA, ESA and the Hubble Heritage Team STScI/AURA). Acknowledgment: J. Gallagher (University of Wisconsin), M. Mountain (STScI) and P. Puxley (NSF). Inset radio-image credit: Varenius et al. (2015)

M 82: Resolved SNR shells!

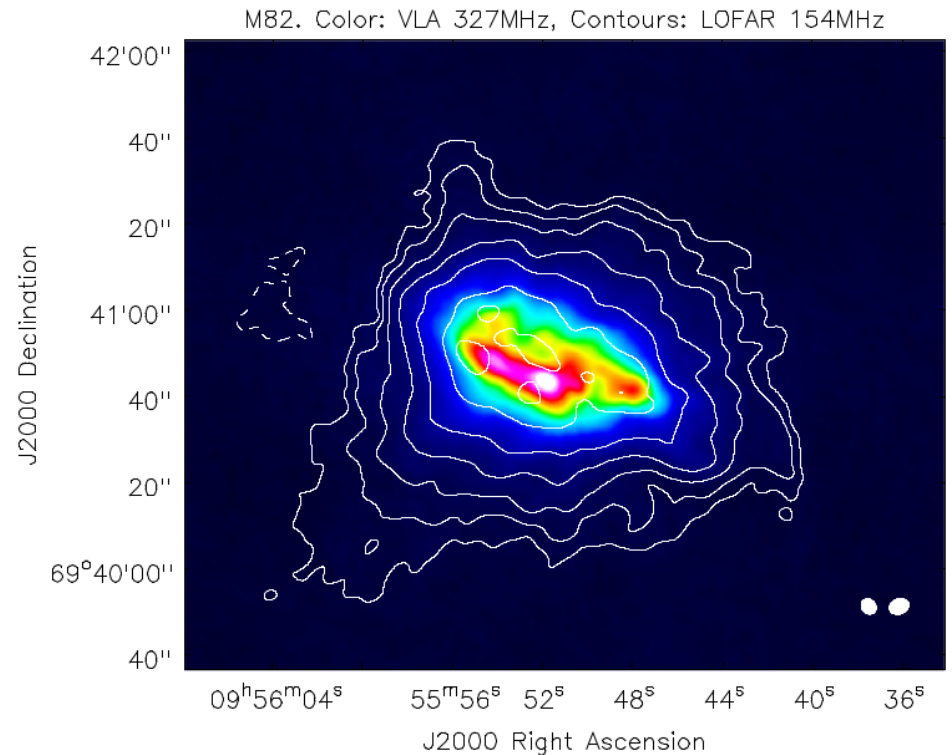


M 82: A clumpy absorbing medium?



M 82: Work in progress ...

- Study spectrum of diffuse emission
- Include more SNRs (upper limits) to map the absorption
- Map HBA recombination lines



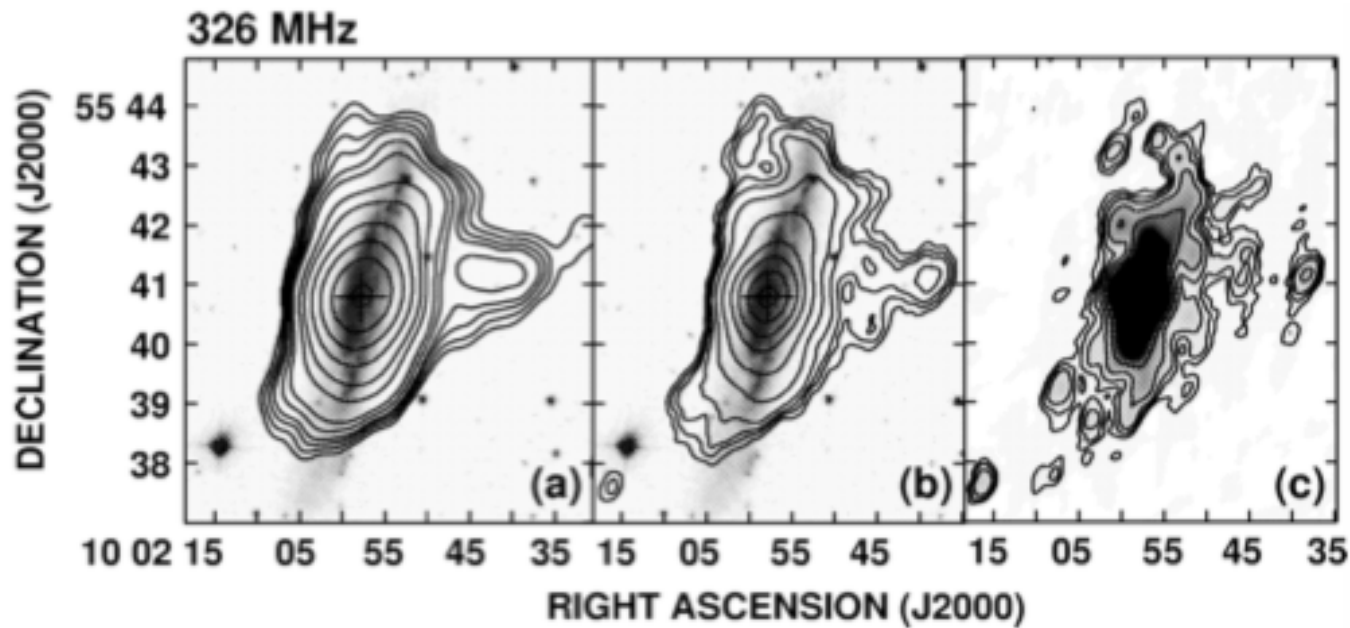
Contour: LOFAR 154MHz,
Color: VLA 327MHz
(Varenius et al. in prep.)

NGC 3079 (16 Mpc)

3.5'
17.5 kpc

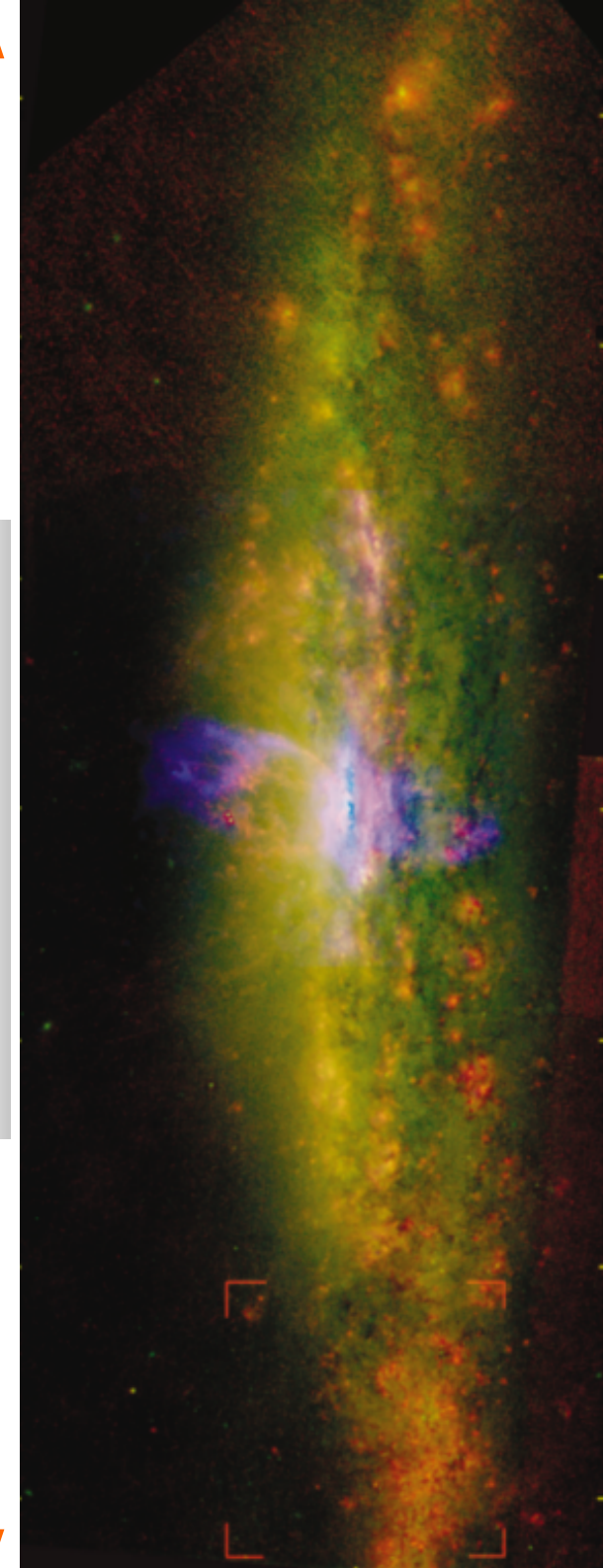
Aim: Study star formation and fermi-bubble in the center.

Data: Project LC1_037, 10h, 72MHz bandwidth in HBA.

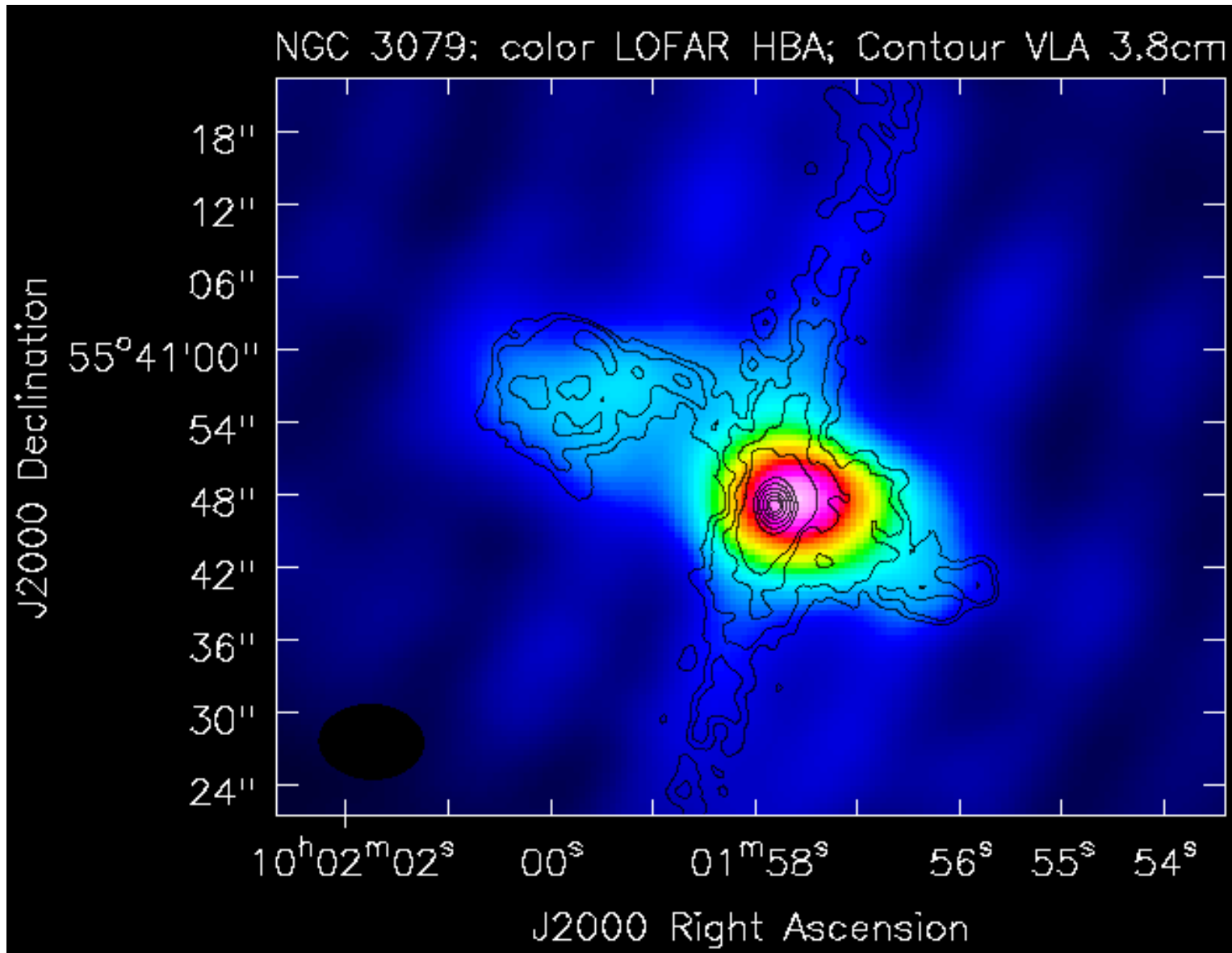


Left: GMRT 326 MHz, res. 50", 40", 20". Large scale radio.
From Irwin and Saikia (2003).

Right: HST [Nii]+H α (red), I-band (green). Blue is VLA 3.8 cm continuum (1.65" x 1.59"). Nuclear bubble. (Cecil et al. 2001).



NGC 3079: first RS image



Nice agreement
with VLA 3.8 cm!

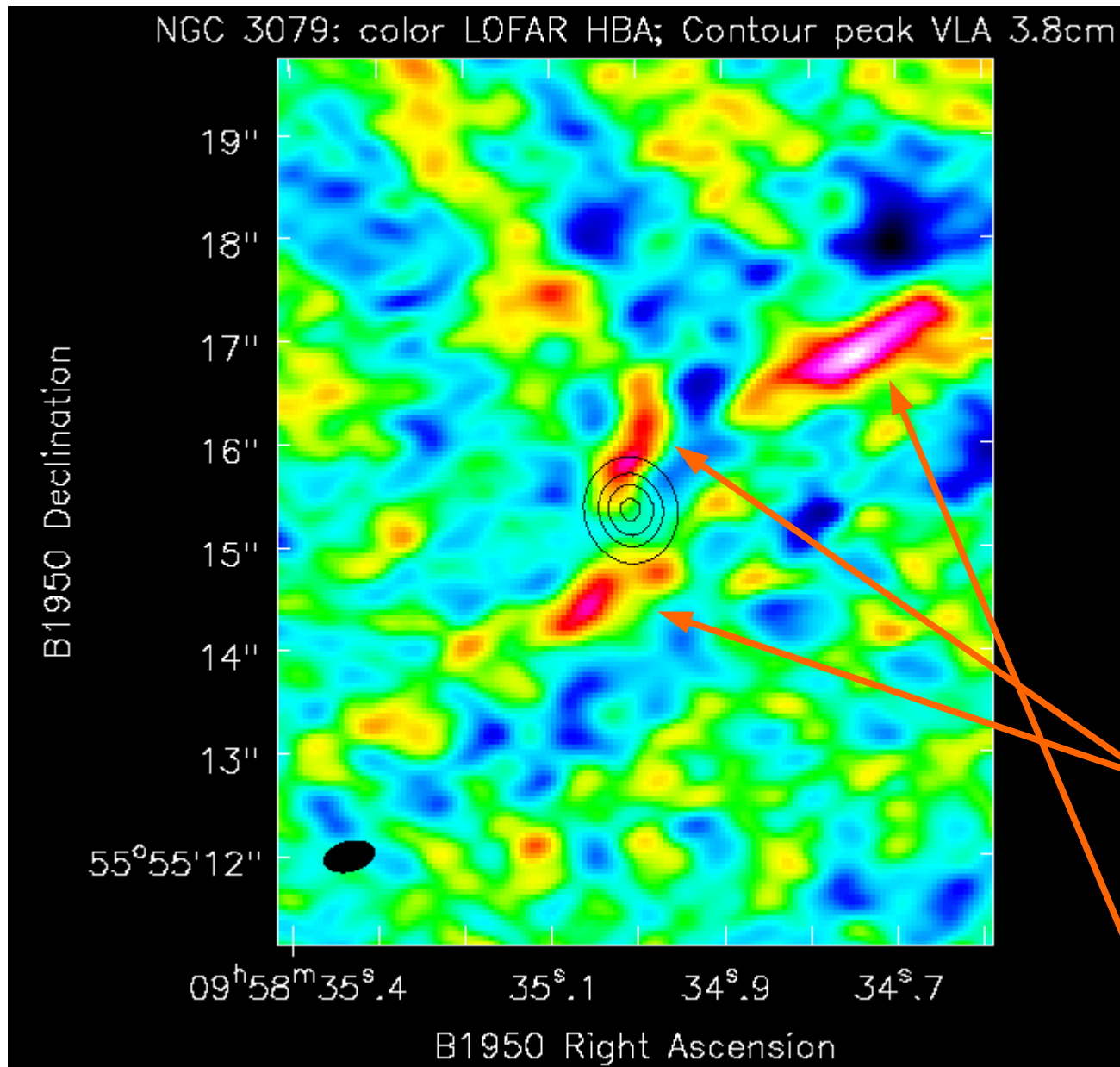
Better resolution
than GMRT but still
dynamic range
limited.

Multi-scale clean
running (as we
speak) to improve
fidelity of extended
radio emission.

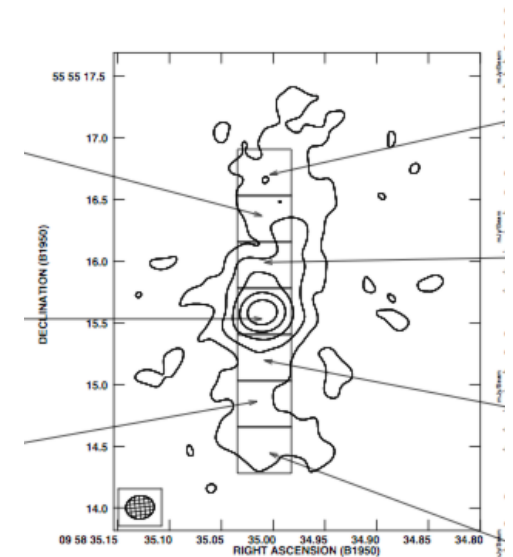
If needed: uv-
subtract 5 Jy point
source 0.7 deg
south-west.

LOFAR HBA, baselines 0.1-60k λ i.e. resolution 9" x 6".
Varenius et al. in prep.

NGC 3079: Subarcsecond imaging



Right: MERLIN 18 cm (0.2").
Left-color: Int. LOFAR HBA (0.3").
Left-contour: Peak of VLA 3.8 cm.



Beswick et al, in prep

“MERLIN feature”
is probably star-forming disk
(diameter 230pc, thickness 50pc).

But what is this? Don't know, yet!

Preliminary rms noise: 0.15 mJy/beam. Varenus et al. in prep.

Summary

- LOFAR international baseline imaging works!
- Subarcsecond imaging of M 82 resolve SNRs and produce nice spectra.
- Preliminary imaging of NGC 3079 is promising, revealing nuclear radio lobes and possible star forming disc.

More to come soon!

